

# KANSAS COOPERATIVE PLANT DISEASE SURVEY REPORT

## PRELIMINARY 2011 KANSAS WHEAT DISEASE LOSS ESTIMATES

AUGUST 18, 2011

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This article was posted to the following website:

[http://www.ksda.gov/includes/document\\_center/plant\\_protection/Plant\\_Disease\\_Reports/2011KSWheatDiseaseLossEstimates.pdf](http://www.ksda.gov/includes/document_center/plant_protection/Plant_Disease_Reports/2011KSWheatDiseaseLossEstimates.pdf)

### **HIGHLIGHTS**

The cumulative disease loss estimate for the 2011 wheat crop was 6.2 per cent or 18 million bushels. This loss estimate includes a new category, the lesion nematodes. Surveys have shown lesion nematodes to be cosmopolitan in Kansas production fields. For comparison, the 2011 overall loss estimate is similar to 2009 (not including lesion nematodes), well below the 20 year average of 11.7 per cent.

The KANSAS AGRICULTURAL STATISTICS SERVICE July forecast of 273 million bushels represented an expected harvest of 7.8 million acres of wheat with an average yield of 35 bushels per acre. Producers abandoned one million acres of the 2011 crop. The abandonment was primarily from drought in the western third of the state.

Viral diseases were of importance in 2011 as barley yellow dwarf virus and wheat streak mosaic had numerous reports. Lesion nematodes are common to Kansas fields and 2011 sampling again verified consistent levels with previous intensive surveys. Barley yellow dwarf was estimated to have caused 2.7% loss, wheat streak mosaic 1.7% loss, and lesion nematodes 1.6% loss. All other diseases including leaf rust and stripe rust accounted for less than 0.2 % in loss (Figure 2).

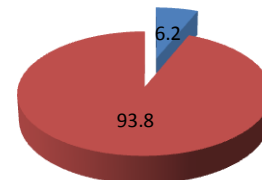


Figure 1. Comparison of disease loss % (blue) to production % (red).

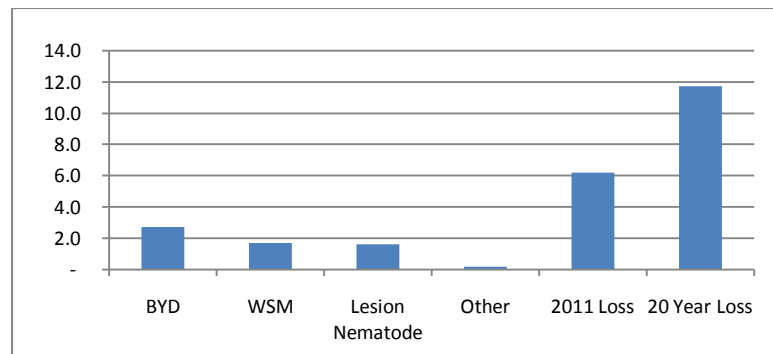


Figure 2. Individual losses (%) compared to 2011 total and 20 year loss

In the long term, peaks and valleys associated with epidemics and weather influences have marked the twenty years of loss estimates and seen a slight decline trend for losses (Figure. 3). 2011 was a valley and without lesion nematodes, the estimate would have been 4.6%.

## DISEASES

**Barley yellow dwarf** is a virus that spreads by aphids in both the fall and spring. BYD epidemics have been difficult to predict and this year was no exception. It was not until early May before high levels of BYD were observed in part due to the drought's influence on wheat development. Large numbers of aphids were not seen in the fall and early spring.

The most severe areas for BYD were central and south central Kansas. In central Kansas, some common observations were at 15 to 75 per cent incidence. Sampling and laboratory analysis additionally found nearby non-symptomatic plants often were infected. The loss to susceptible varieties that make up almost half the acres was calculated at nearly 11% after considering a loss model and distribution and frequencies of reports. In south central and southeast Kansas, susceptible varieties losses were 8 per cent and in northeast Kansas 5 per cent to the aphid vectored virus. Central and south central districts total loss of all varieties exceeded 5 per cent for BYD (Fig. 4). The five and twenty year statewide loss averages are 0.7 and 1.2%, respectively with 2011 estimated at 2.7%.

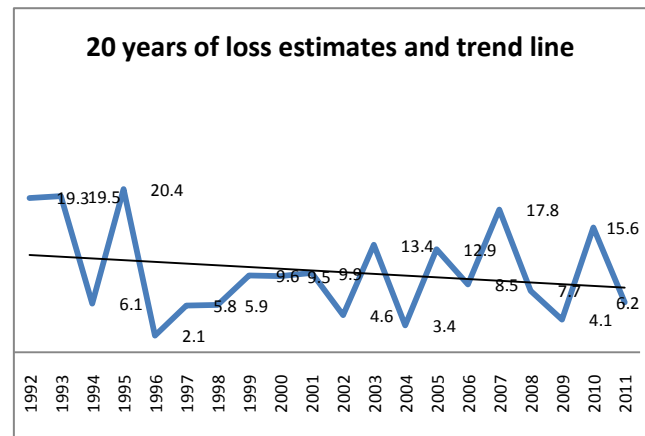


Figure3. Line graph of 20 years of loss estimates with linear trend line

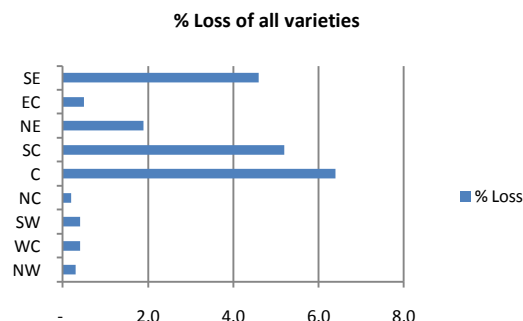


Figure 4. Barley yellow dwarf loss estimates for crop reporting districts

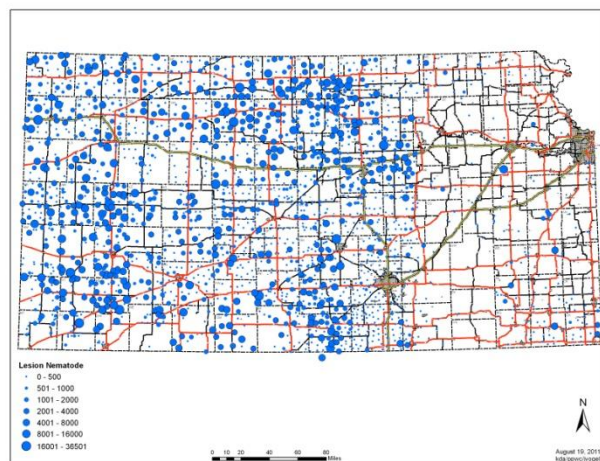
**Wheat streak mosaic complex** was the second most important disease for 2011 but some producers in west central and north central Kansas would argue that it indeed was number one. It was in these districts that select fields had extreme levels of wheat streak mosaic and losses were staggering. The potential for bushels was better than average for these districts but producers sometimes finished with nothing as they were compelled to disc up virus- infected wheat that was not going to produce. Sampling and laboratory testing found that the viruses were wheat streak mosaic, triticum mosaic, and high plains virus and sometimes-in combination.

In west central and north central districts, susceptible varieties were estimated to have loss 7% yield and overall had losses of 4.7 and 3.1 % respectively. Loss estimates for the remainder of the state were in southwest (2%), central (2.1%), and northwest (0.7%) districts. Overall, state production was reduced by 1.7 %. The twenty-year average loss is 0.9%.

**Lesion nematodes** are new to the wheat loss estimates. These nematodes are primarily found inside the wheat rootlets where they burrow and feed on tissue (Fig. 5). In 2010, Kansas Department of Agriculture and Kansas State University completed a three-year study funded by the United States Department of Agriculture with the goal of better understanding the soil nematode complex affecting wheat production. From this study (unpublished), lesion nematodes primarily *Pratylenchus neglectus* were found in over 75% per cent of the root samples and sometimes exceeded over 20,000 individuals per gram of dry root (Fig 6). These numbers are similar to a study done in the Pacific Northwest by Oregon State University and information from researchers in wheat growing regions of the world including Australia.



Fig 5. Lesion nematodes (stained) inside a wheat rootlet, Oregon State University.



In 2011, a small monitoring survey of 36 samples in 16 central and western counties was done and found 83% per of the sites with lesion nematode and averaged 2,300 nematodes per gram of dry root weight. Based upon a loss model where each 1000 nematodes account for a 1% loss, adjusting for sampling date (2011 was late compared to the 2008-2010 study) and extrapolating to other areas of the state not sampled, the 2011 loss estimate was set at 1.6 % compared to a 2 % loss of the three- year study.

Figure 6. Distribution map of lesion nematodes in wheat roots (per gram of dry root) samples taken in KS study.

**Rust diseases** historically are big components to wheat loss estimates here in Kansas. In 2011, because of extreme drought both here and in Oklahoma and Texas (*Puccinia* cereal rust pathway for inoculum), leaf rust and stripe rust did not develop to pose any real threat to production. Stripe rust was estimated to cause a 0.05 % loss with some infection in northern counties. Leaf rust estimate was set at 0.01%. Historical averages of 20 years are 3.4% for leaf rust and 1.8% for stripe rust. Both diseases have estimates exceeding 10% in epidemics and responsible for many of the peaks in Figure 3 - Line graph of 20 year losses.

**Other diseases** were noted but of little consequence (Fig. 2) to the overall yield loss estimate of 2011. *Septoria* diseases and tan spot were estimated at 0.01%, well below their historical averages of about 1%. Scab head disease was not a factor to the crop and neither were powdery mildew, soilborne and spindle streak viruses, stem rust, bacterial foliar diseases, bunts and smuts, or root and crown rots. Karnal bunt was not found in KDA/USDA export sampling again for the eighteenth year. *Cephalosporium* stripe was noted in some wheat and ergot was reported to be a problem in some harvested grain in northeast Kansas. Kansas wheat production has not had any issues with ergot since the early 1990's.

Disease	2011 Loss	20 yr avg
Leaf rust	0.01	3.4
Stripe rust	0.05	1.8
BYD	2.74	1.2
WSM	1.70	0.9
Lesion N.	1.60	1.8 (2 yr)
Other	0.16	2.5
Total loss (rounded)	6.2	11.7

Table 1. Loss comparisons of major diseases in 2011

- Estimates prepared by Kansas State University, Kansas Department of Agriculture and USDA-ARS personnel. Estimates are based on expert opinions, but are not statistically designed.
- Estimates utilize a disease survey, variety resistance, variety acreages, crop district yield estimates, and loss functions or estimates for each disease. The Kansas Agricultural Statistics provided information for variety acreages and crop district yield estimates.
- Special thanks to the staff at the Great Plains Diagnostic Laboratory, Kansas State University and the Plant Protection & Weed Control Program, Kansas Department of Agriculture for their help in survey and diagnosis of wheat diseases. Without their contribution, this paper would not be possible.